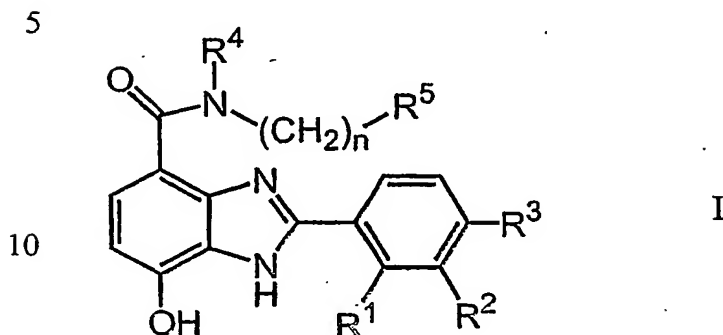


What is claimed is

1. A compound of formula (I), and a pharmaceutically acceptable salt, hydrate, solvate or isomer thereof:



wherein:

15  $n$  is 0, 1, 2 or 3;

$R^1$ ,  $R^2$  and  $R^3$  are each independently hydrogen, hydroxy, halogen or morpholin-1-yl-ethylamino;

$R^4$  and  $R^5$  are each independently hydrogen;

20 linear or cyclic  $C_1$ - $C_6$  alkyl optionally having one or more substituents, the carbon of the alkyl being optionally replaced with nitrogen, sulfur or oxygen, wherein the substituent is: hydroxy; halogen; alkyloxy; alkyl; amino; alkylamino; carboxyl; nitro; sulfonylamido; alkanesulfonyl; amido; an aromatic group optionally having one or more substituents selected from the group consisting of hydroxy, halogen, alkyloxy, alkyl, amino, alkylamino, carboxyl, nitro, amido, dioxoisindole and sulfonylamino; an aromatic group having one or more substituents selected from the group consisting of hydroxy, halogen, alkyloxy, alkyl, amino, alkylamino, carboxyl, nitro and amido, the aromatic ring having nitrogen, sulfur or oxygen; or cyclic  $C_3$ - $C_8$  alkyl optionally having one or more substituents selected from the group consisting of hydroxy, halogen, alkyloxy, alkyl, amino, alkylamino, carboxyl, nitro and amido;

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an aromatic group optionally having one or more substituents, the aromatic ring having optional nitrogen, sulfur or oxygen, wherein the substituent is; hydroxy; halogen; alkyloxy; alkyl; amino; alkylamino; carboxyl; nitro; sulfonylamido, alkanesulfonyl; amido; or linear or cyclic  $C_1$ - $C_6$  alkyl optionally having one or more substituents, the alkyl having an optional nitrogen, sulfur or oxygen linkage and the substituent of the alkyl

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being: hydroxy; halogen; alkyloxy; alkyl; amino; alkylamino; carboxyl; nitro; sulfonylamido, alkanesulfonyl; amido; an aromatic group optionally having one or more substituents selected from the group consisting of hydroxy; halogen; alkyloxy; alkyl; amino; alkylamino; carboxyl; nitro; amido; dioxoisindole; and a sulfonylamino having an aromatic group substituted with hydroxy, halogen, alkyloxy, alkyl, amino, alkylamino, carboxyl, nitro, sulfonylamido, alkanesulfonyl or amido; an aromatic group optionally having one or more substituents selected from the group consisting of hydroxy, halogen, alkyloxy, alkyl, amino, alkylamino, carboxyl, nitro, sulfonylamide, alkanesulfonyl and amido, the aromatic ring containing nitrogen, sulfur or oxygen; or a cyclic C<sub>3</sub>-C<sub>8</sub> alkyl optionally having one or more substituents selected from the group consisting of hydroxy, halogen, alkyloxy, alkyl, amino, alkylamino, carboxyl, nitro and amido; or

form, together with the -N-(CH<sub>2</sub>)<sub>n</sub>- moiety to which they are attached, a nitrogen heterocycle optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub>, NO<sub>2</sub>, the heterocycle containing optional nitrogen or oxygen.

2. The compound of claim 1, wherein R<sup>4</sup> and R<sup>5</sup> are each independently hydrogen;

C<sub>1</sub>-C<sub>4</sub> alkyl optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub>, NO<sub>2</sub>, and an aromatic group, the aromatic group optionally having one or more substituents selected from the group consisting of OH, C<sub>1</sub>-C<sub>4</sub> alkyloxy, NH<sub>2</sub>, NO<sub>2</sub>, methanesulfonylamino, ethanesulfonylamino, tolunensulfonylamino and dioxoisindole; cyclic C<sub>3</sub>-C<sub>8</sub> alkyl optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub> and NO<sub>2</sub>; C<sub>1</sub>-C<sub>4</sub> alkyl carrying a morpholine or oxopyrrolidine group which is optionally substituted with OH, NH<sub>2</sub>, NO<sub>2</sub> or -O-; C<sub>1</sub>-C<sub>4</sub> alkyl or C<sub>1</sub>-C<sub>4</sub> aminoalkyl carrying a pyrrol, pyrazole, imidazole, 1,2,3-triazole, 1,2,4-triazole, isoxazole, oxazole, isotiazole, tiazolidine, tiazole, 1,2,5-oxadiazole, 1,2,3-oxadiazole, 1,2,5-thiodiazole, 1,2,3-thiodiazole, 1,3,4-oxadiazole, 1,3,4-thiodiazole, pyridine, pyrimidine or triazine group which is optionally having one or more substituents selected from the group consisting of Cl, OH, NH<sub>2</sub>, NO<sub>2</sub>, C<sub>1</sub>-C<sub>4</sub> and phenyl;

cyclic C<sub>3</sub>-C<sub>8</sub> alkyl optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub> and NO<sub>2</sub>;

an aromatic group optionally having one or more substituents selected

from the group consisting of OH; NH<sub>2</sub>; hydroxyalkyl; aminoalkyl; NO<sub>2</sub>; and a C<sub>1</sub>-C<sub>4</sub> alkyl group optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub>, NO<sub>2</sub>, methanesulfonylamino, ethanesulfonylamino, toluenesulfonylamino, dioxoisindole and thiophenesulfonylamino; or

form, together with the -N-(CH<sub>2</sub>)<sub>n</sub>- moiety to which they are attached, a nitrogen heterocycle optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub> and NO<sub>2</sub>, the heterocycle containing 1 to 3 nitrogen, sulfur or oxygen atom.

3. The compound of claim 1, wherein R<sup>4</sup> and R<sup>5</sup> are each independently hydrogen;

C<sub>1</sub>-C<sub>4</sub> alkyl optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub>, NO<sub>2</sub>, morpholine, nitropyridineamino, pyridine, oxopyrrolidin, imidazole optionally having a Cl, CH<sub>3</sub> or phenyl substituent; and phenyl optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub>, methoxy, NO<sub>2</sub>, methanesulfonylamino, ethanesulfonylamino, toluenesulfonylamino and dioxoisindole;

cyclic C<sub>3</sub>-C<sub>8</sub> alkyl optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub> and NO<sub>2</sub>;

phenyl optionally having one or more substituents selected from the group consisting of OH; NH<sub>2</sub>; NO<sub>2</sub>; and C<sub>1</sub>-C<sub>4</sub> alkyl optionally having a OH, NH<sub>2</sub>, NO<sub>2</sub>, methanesulfonylamino, ethanesulfonylamino, toluenesulfonylamino, dioxoisindole or thiophenesulfonylamino substituent; or

form, together with -N-(CH<sub>2</sub>)<sub>n</sub>- moiety to which they are attached, a piperidine ring optionally having one or more substituents selected from the group consisting of OH, NH<sub>2</sub> and NO<sub>2</sub>.

4. A process for preparing the compound of formula (IA) which comprises the steps of:

reacting 3-amino-4-methoxy benzoic acid (compound II) and an alcohol to obtain compound (III);

adding anhydrous *p*-toluenesulfonic acid and benzonitrile to the compound (III) thus obtained, refluxing the mixture at 80 to 200 °C, adding NaOCl thereto at room temperature and purifying by silica gel column

chromatography to obtain compound (IV);

dissolving the compound (IV) thus obtained in an alcohol, adding an aqueous alkali solution thereto and refluxing the mixture to obtain compound (V);

5 dissolving the compound (V) thus obtained in an organic solvent, adding a Lewis acid thereto and refluxing the mixture to obtain compound (VI);

dissolving the compound (V) thus obtained in alcohol, adding a strong acid thereto at room temperature and refluxing the mixture to obtain  
10 compound (VII);

dissolving the compound (VII) thus obtained and (4-bromomethylphenoxy)-methyl polystyrene Wang resin in an organic solvent, adding a base and KI thereto and stirring the mixture at 50 to 60 °C for 1 to 24 hours to obtain compound (VIII);

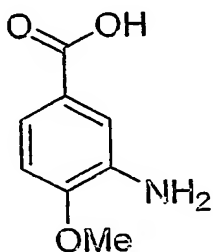
15 dissolving the compound (VIII) thus obtained in an organic solvent, adding an alcohol solution of an alkali hydroxide thereto and refluxing the mixture to obtain compound (IX);

dissolving the compound (IX) thus obtained in an organic solvent, adding  $R^4N(CH_2)_nR^5$  and a coupling agent thereto and stirring the mixture at  
20 room temperature to obtain compound (X); and

dissolving the compound (X) thus obtained in  $CH_2Cl_2$ , adding trifluoroacetic acid thereto and stirring the mixture at room temperature to obtain compound (Ia).

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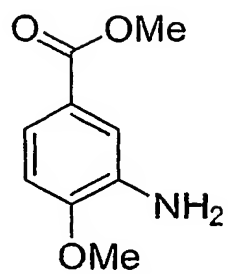
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II

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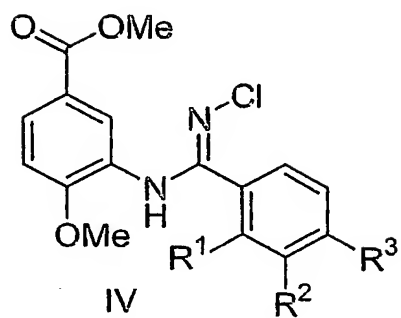
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III

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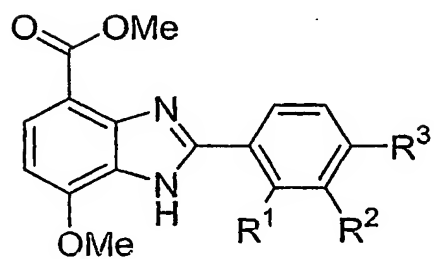
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IV

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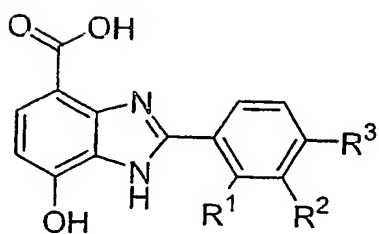
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V

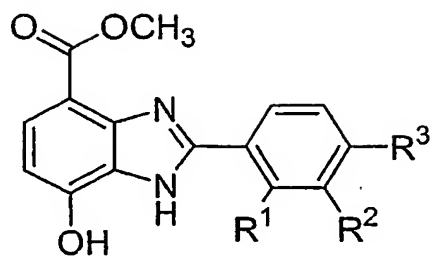
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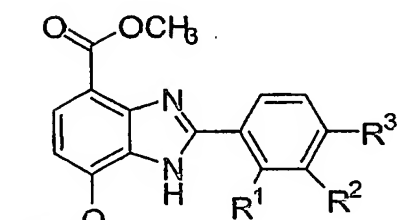
VI

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VII

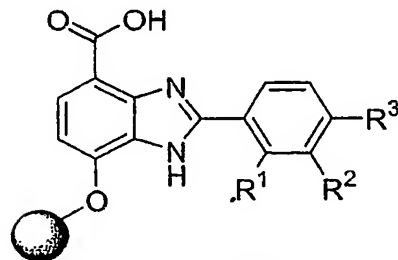
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VIII

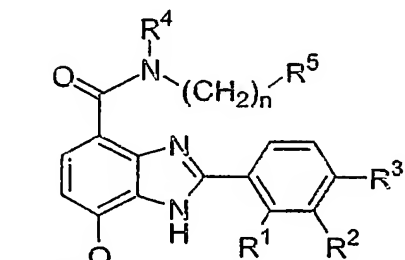
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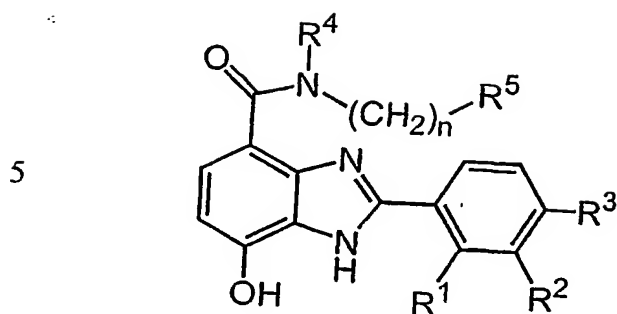
IX

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X



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Ia

wherein,  $n$ ,  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$  and  $R^5$  have the same meaning as defined in claim 1.

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5. A process for preparing the compound of formula (Ib) which comprises the steps of:

reacting 3-amino-4-methoxy benzoic acid (compound II) and an alcohol to obtain compound (III);

20 adding *p*-toluenesulfonic acid, benzene and 4-nitrobenzonitrile thereto, refluxing the mixture at 80 to 200 °C, adding NaOCl thereto at room temperature and purifying by silica gel column chromatography to obtain compound (XI);

25 dissolving the compound (XI) thus obtained in an organic solvent, adding an aqueous alkali solution thereto, refluxing the mixture and purifying by silica gel column chromatography to obtain compound (XII);

dissolving the compound (XII) thus obtained in an alcohol, adding Pd/C thereto and refluxing the mixture to obtain compound (XIII);

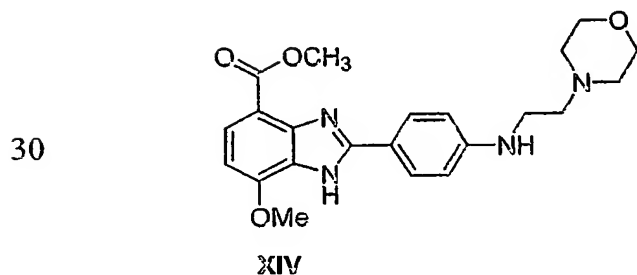
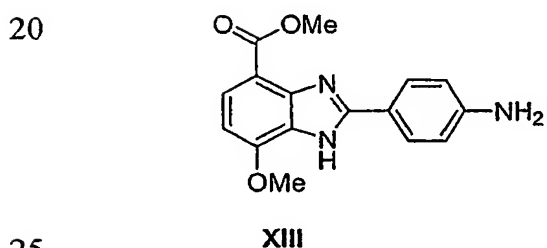
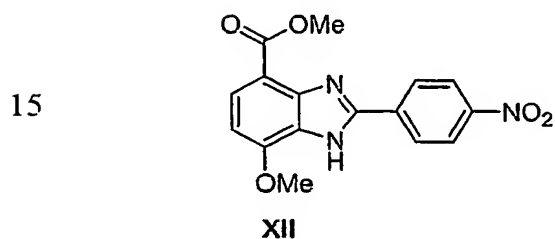
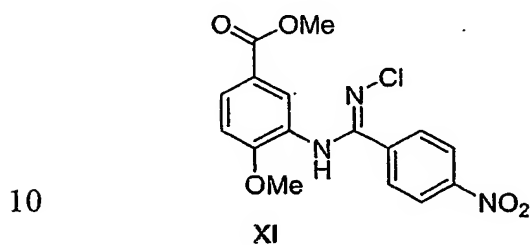
30 dissolving the compound (XIII) thus obtained in an organic solvent, adding a base, 2-chloroethylmorphine and potassium iodide thereto and stirring the mixture at room temperature to obtain compound (XIV);

dissolving the compound (XIV) obtained thus in an organic solvent, adding an alkali hydrate, stirring the mixture at room temperature to obtain compound (XV);

35 dissolving the compound (XV) thus obtained in an organic solvent, adding 4,5-dichloro-1-(3-aminopropyl)imidazole and a coupling agent, stirring the mixture at room temperature and purifying by silica gel column chromatography to obtain compound (XVI); and

dissolving the compound (XVI) thus obtained in MC, adding a Lewis acid thereto, stirring the mixture, concentrating the resulting solution under a reduced pressure and purifying by silica gel column chromatography to obtain compound (Ib):

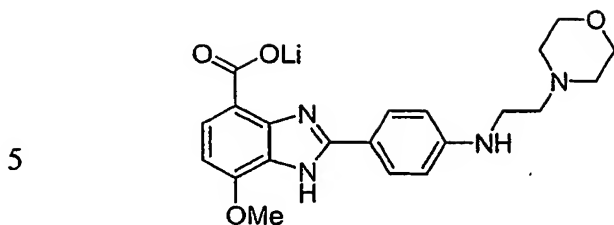
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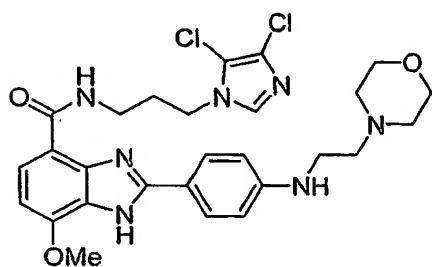
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XV

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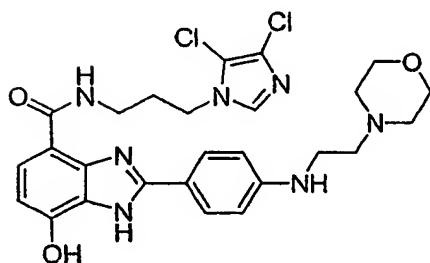
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XVI

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wherein, n, R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> have the same meaning as defined in claim 1.

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6. A pharmaceutical composition for inhibiting GSK-3 $\beta$  comprising a therapeutically effective amount of the compound of claim 1 and a pharmaceutically acceptable carrier.

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